

How to Set Up SurvCE for Slope Staking

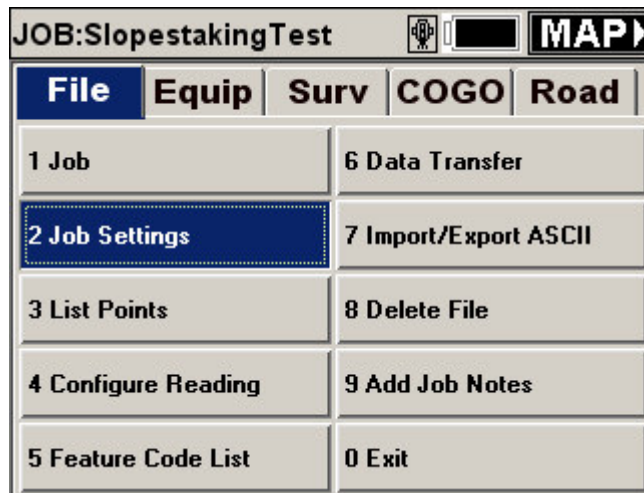
This procedure will walk you through the steps of slope staking with the Total Station and the Allegro/SurvCE data collector. When Slope Staking is selected, you are presented with a Definition Method screen, where you choose among the 4 methods of Slope Staking: **User Defined**, **Point-Defined Alignments**, **Design Files** or **Section Files**.

For this procedure we'll focus on the **User Defined** method. We will be writing separate procedures for the other methods at a later date.

First, we'll set up our Slope Stake Cutsheet report where we'll save our slope staking data. Let's begin...

With SurvCE running go to the **File** tab and then **2 Job Settings**.

As shown in the dialog box below:



Under the **Job Settings** menu, click on the **Stakeout** tab and you will see the box below. You may or may not want to check “On” the **Store Carlson Cutsheet Data in Note File**. This option specifies whether or not to store the stakeout data in the note file (.NOT) for the current job. At the end of staking a point, there is an option to store the staked coordinates in the current job. This stakeout note file option allows you to store more stakeout data in addition to the staked coordinates. This additional data includes the target coordinates and horizontal and vertical differences between the staked and target points.

If you're doing slope staking you want this option checked “Off.” Otherwise you'll get a lot of additional info put in your note file that is also saved in your Slope Stake Cutsheet.

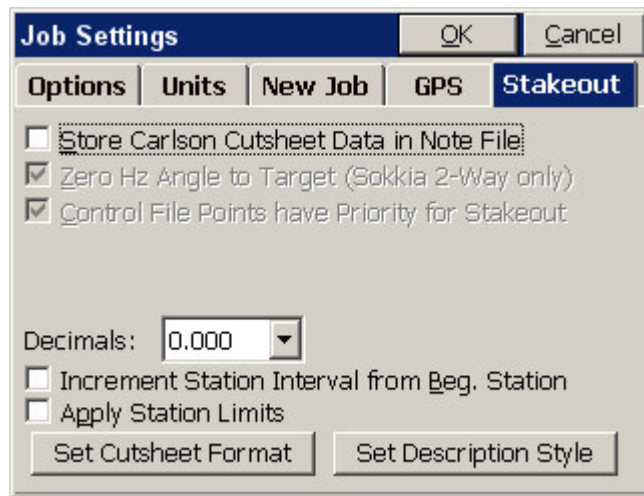
The toggle **Increment Station Interval from Beg Station** is normally checked OFF.

For centerlines that start on an “odd” station such as 10+20, this option would conduct stakeout by interval measured from station 10+20. So a 50 interval stakeout distance, instead of being 10+50, 11+00, 11+50 would be 10+20, 10+70, 11+20, etc. Most users will want this toggle off. There are times when having this toggle on could be useful.

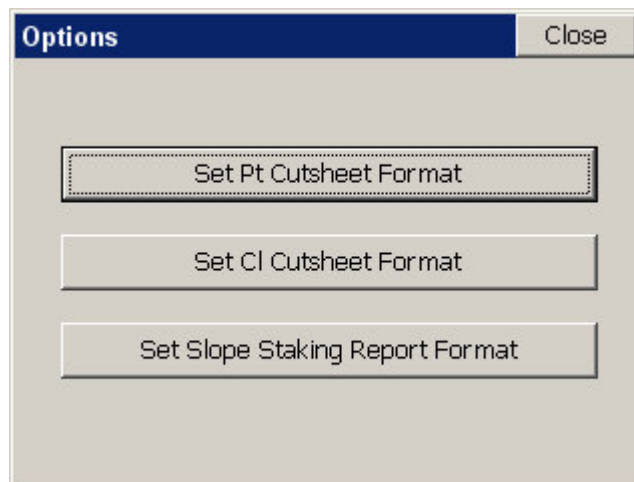
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Apply Station Limits: When selected, the program will not automatically advance beyond the natural start and end of a given centerline.

To set up your Slope Stake Cutsheet click on the **Set Cutsheet Format**

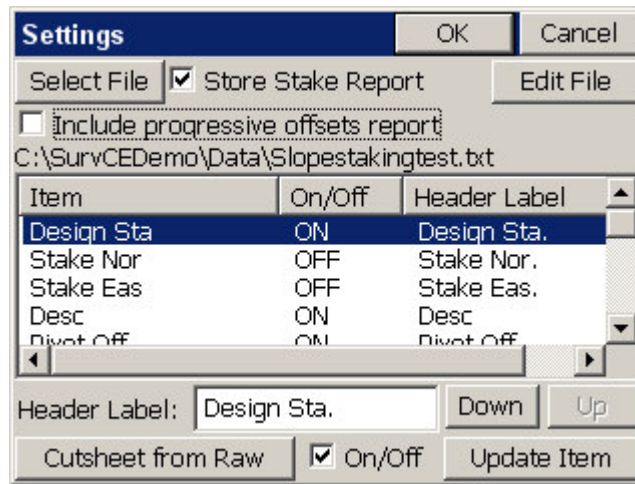


It will bring up the following dialog box. Click ON, **Set Slope Staking Report Format.**



NOTE: These three options allow you to customize the respective output report. To change an item label, highlight the item, change the **Header Label** field, then tap **Update Item**. You can select an item in the list and turn it ON or OFF, by highlighting the item, then checking the ON/OFF button. You can also control the order of the report items by using the **Move Down** and **Move Up** buttons. Other options in this dialog are shown below.

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In the dialog above, **Select File** allows you to select/create the output file. The path and name of the file is shown just below this button. It's a good idea to note the name and path of this file so you can find it easy later on. Click **Edit File** to edit and review the cutsheet file. You can edit the cutsheet like you would an Excel spreadsheet.

You want to toggle ON the **Store Stake Report**, which will store the report to the selected file. Uncheck this toggle to disable the report.

If **Include Progressive Offsets Report** is turned on, the header lines are ignored and you obtain the incremental, delta distance, and elevation from each point on the section or template from the offset stake to the catch and then all the way to centerline. For user defined this toggle should be OFF.

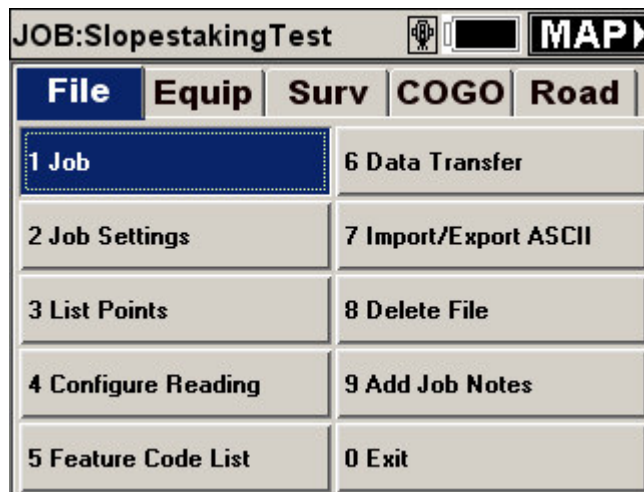
Cutsheet from Raw. SurvCE automatically stores cutsheet data and header information to the raw file for the job. You can capture and report the cutsheet information direct from the raw file. Before doing this, it is recommended that you start a new cutsheet file, configure the header lines and order of info as desired, then run "Cutsheet from Raw."

Once you have made all the desired changes, click **OK**. This will take you back to the **Job Settings** screen, then click **OK**.

Now that we have the Slope Stake Cutsheet on and edited how we'd like we can begin slope staking.

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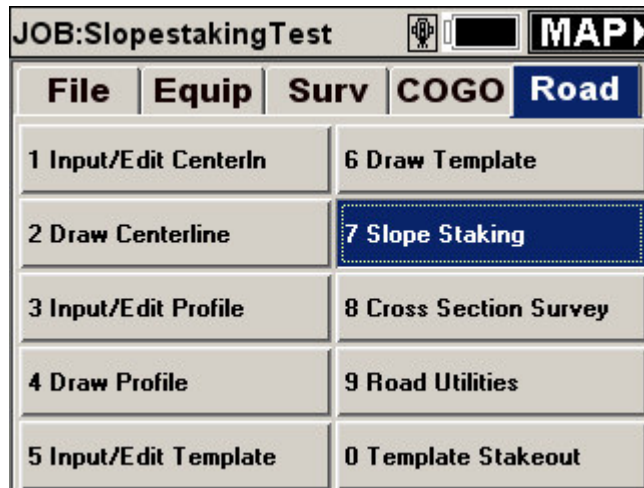
From the Main Menu, shown below, click on the Road tab.



The screenshot shows the 'JOB:SlopestakingTest' window with the 'Road' tab selected. The menu items are as follows:

File	Equip	Surv	COGO	Road
1 Job	6 Data Transfer			
2 Job Settings	7 Import/Export ASCII			
3 List Points	8 Delete File			
4 Configure Reading	9 Add Job Notes			
5 Feature Code List	0 Exit			

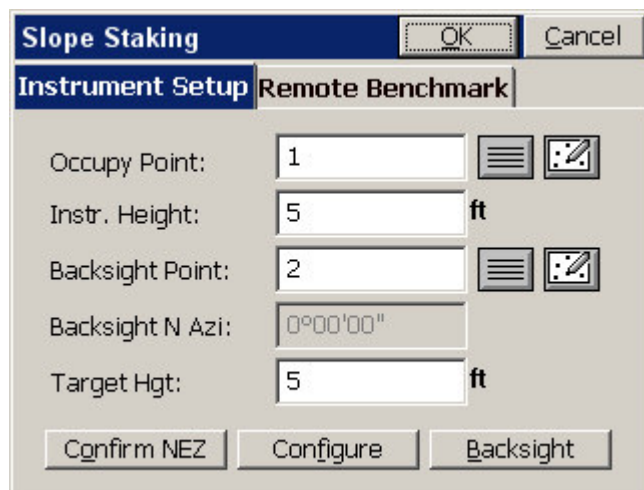
Once in the Road menu, click on 7 Slope Staking



The screenshot shows the 'Road' tab selected in the 'JOB:SlopestakingTest' window. The menu items are as follows:

File	Equip	Surv	COGO	Road
1 Input/Edit Centerln	6 Draw Template			
2 Draw Centerline	7 Slope Staking			
3 Input/Edit Profile	8 Cross Section Survey			
4 Draw Profile	9 Road Utilities			
5 Input/Edit Template	0 Template Stakeout			

This will open up the Instrument Setup dialog box, as shown below.




The 'Slope Staking' dialog box is shown with the 'Instrument Setup' tab selected. The fields and buttons are as follows:

Slope Staking		OK	Cancel
Instrument Setup Remote Benchmark			
Occupy Point:	1	[List Icon]	[Edit Icon]
Instr. Height:	5	ft	
Backsight Point:	2	[List Icon]	[Edit Icon]
Backsight N Azi:	0°00'00"		
Target Hgt:	5	ft	
Confirm NEZ		Configure	Backsight

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If your set up hasn't changed you can simply hit **OK**. Otherwise, enter your Occupied and Backsight points along with their respective heights and click on **Backsight**.

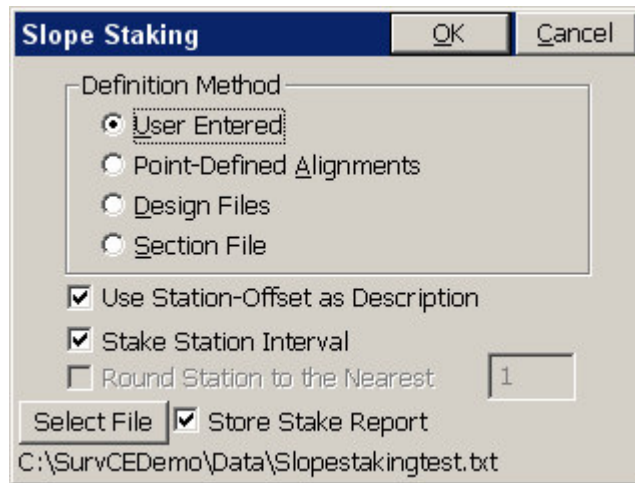


The **Backsight** dialog box has a title bar with **OK**, **Back**, and **Cancel** buttons. Below the title bar is a "Set to Zero" dropdown menu and a text field containing "0°00'00\"". The dialog is divided into two tabs: **Setup** and **Results**. The **Setup** tab contains the following fields:

Field	Value
OC Point:	1
BS Point:	2
BS AZI:	0°00'00"
BS Bearing:	N0°00'00"E
Inst Hgt:	5.000
Target Hgt:	5.000

At the bottom of the **Setup** tab are three buttons: **Set Angle**, **Check Angle**, and **Check**. Below these buttons is a large button labeled **Set Angle and Read**.

Click **Set Angle and Read** to take your backsight shot. If the results are acceptable click, **OK**. If not, click **Back** to re-shoot and/or to make sure your Occupy and Backsight points are the right ones.



The **Slope Staking** dialog box has a title bar with **OK** and **Cancel** buttons. Below the title bar is a "Definition Method" section with four radio buttons:

- ☒ **User Entered**
- ☐ Point-Defined Alignments
- ☐ Design Files
- ☐ Section File

Below the radio buttons are three checkboxes:

- ☒ Use Station-Offset as Description
- ☒ Stake Station Interval
- ☐ Round Station to the Nearest

To the right of the "Round Station to the Nearest" checkbox is a text field containing the value "1". Below these checkboxes is a "Select File" button and a checked checkbox labeled **Store Stake Report**. At the bottom of the dialog is a text field containing the file path "C:\SurvCEDemo\Data\Slopestakingtest.txt".

Once the Backsight is accepted it will open up the following Slope Staking screen as shown above. For this procedure we'll choose **User Entered** for our Definition Method. You must decide if you want the **Use Station-Offset as Description** toggled ON or OFF. Here's why; if you do store any of these 3 possible points (Catch, 1st offset and/or the 2nd offset) clicking of this option will store the actual, staked station and offset as the default description. You can append or overwrite it, however. If this is clicked off, the default description for the catch point is "CATCH OFFSET" and there is no default for either of the offset points. We'll keep it on for this procedure. That way, we'll know the actual station and offset we've staked too.

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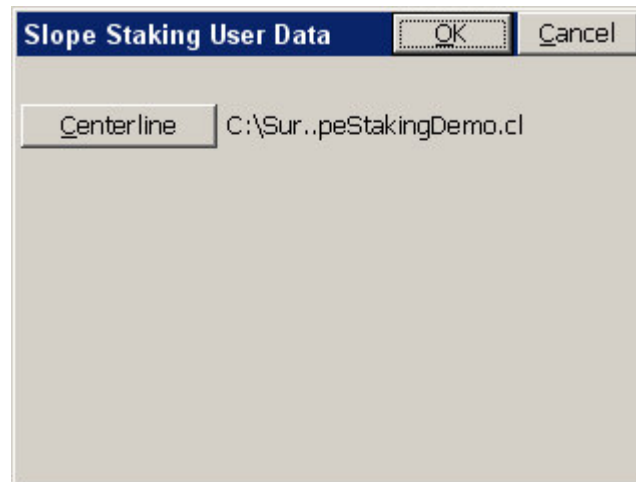
When **User Entered** is the method, it doesn't matter if the **Stake Station Interval** is on or off because the pivot offset and elevation is used regardless of station position. In the other methods, the pivot elevation is recalculated dynamically as you move based on the known information (3D points, profile, sections). Since we are using User Entered, we'll leave it toggled ON for now.

We want to make sure we have **Store Stake Report** toggled ON. The path and file of the Slope Stake Report is shown below the Select File tab. As noted before, if this path or file is not correct, click on **Select File** to change it.

We'll keep the **Round Station to the Nearest** toggled OFF. We do not want to round our stations or offsets.

Once these options are all set click **OK**.

That will open up the *Slope Staking User Data* dialog box shown below. Since our Definition Method is **User Entered**, only the **Centerline** tab will show up. If the alignment you are using shows up next to the centerline tab you can simply hit **OK** to accept this alignment. If not, click on **Centerline** and chose the appropriate alignment. Once you've chosen the alignment, click **OK** in the *CL File* dialog box. Then **OK** in the *Slope Staking User Data* dialog box.



That will open up the *Station for Slope Staking* box. As you can see below, this is where you enter the **Station**, **Next Interval** distance, **Pivot Off** and **Pivot Elev**. The "Pivot" point that SurvCE refers to would be your "SGS" (Sub-grade Shoulder) if in a fill section. In a Cut/ditch section it would be your "BKD" (Back of Ditch) or, possibly, BD (Bottom of Ditch) depending on what point your staking to. Typically the pivot point, whether it's SGS or BKD will be pre-calculated and printed from an Engineering Design package (CAiCE, Inroads, etc.). The print out/report will usually give offset distance and grade (elevation) for each calculated point as well as the hypothetical "Catch" point. The hypothetical catch point is calculated using the design software and is only an educated guess as to where it will be. If the contractor removed too much material during 'Clearing and Grubbing' the distance of this hypothetical point will change. For this reason, slope staking is done to confirm the design and also used to calculate quantities for pay items.

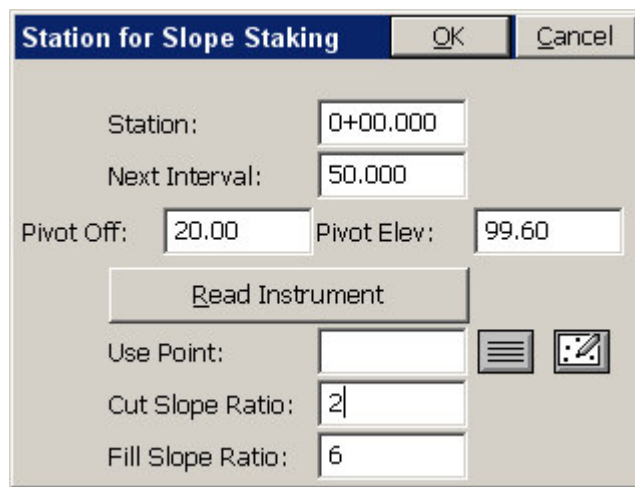
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For **User Entered** we will take this **Pivot Off** and **Pivot Elev** from the design print out and enter it in our *Station for Slope Staking* dialog box. Or, If you have a point number assigned to your pivot point you can enter it as **Use Point** or click on the “list” icon or the map screen to pick the point that way.

For this procedure we’ll be staking station, 0+00, with a Pivot Off (SGS) of 20 ft right, with a Pivot Elev (calc’d grade) of 99.60. Our “Fill” slope ration is a 6:1.

NOTE: *Pivot offsets should be entered as positive numbers even left of centerline, since the program will detect which side of centerline you are on from the first total station reading. This is different than how we used to use our SDR33 data collectors.*

You can see in the *Station for Slope Staking* box below the info that is entered.



The image shows a dialog box titled "Station for Slope Staking" with "OK" and "Cancel" buttons. The fields are filled with the following values: Station: 0+00.000, Next Interval: 50.000, Pivot Off: 20.00, Pivot Elev: 99.60. There is a "Read Instrument" button. Below this, "Use Point:" has an empty field and two icons (a list icon and a map icon). "Cut Slope Ratio:" is 2 and "Fill Slope Ratio:" is 6.

Once you have all of your info for station 0+00 entered, Click on **OK** to begin the slope staking process. This will open up the *SLOPE STK* Map screen as shown below.

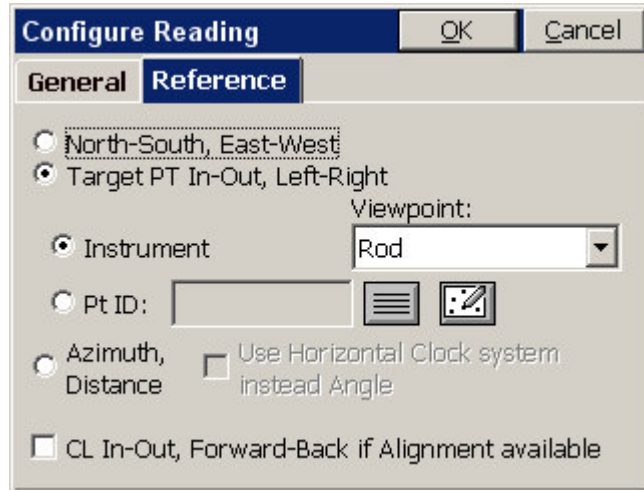


The image shows the "SLOPE STK" screen. At the top, it says "Turn to AR: 90°00'00\"

If you click on “**C**” (Configure) you can change the perspective “view” for slope staking. If your slope staking and need to change the Cut and/or Fill Slope from say a 6:1 to a 5:1, click on “**M**” (Modify) to change the slope.

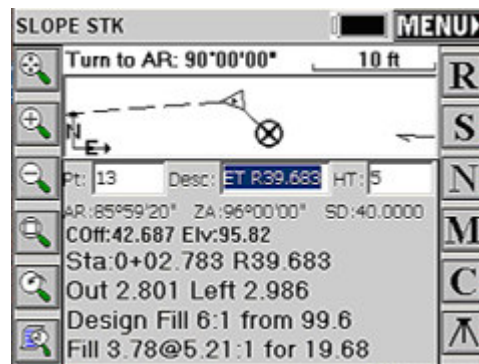
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I like to set it up as below – with Target PT In-Out, Left-Right and Instrument toggled ON with the Viewpoint set to Rod. That way, after taking a reading, SurvCE will give in/out and left/right from the Rodman's perspective. If you have an instrument person they can just relay the numbers over the radio. For those using a robotic instrument, with the data collector on the rod, they can simply walk to the point they're slope staking.



When you get this box how you want it, click **OK**. It will take you back to the *SLOPE STK* Map screen.

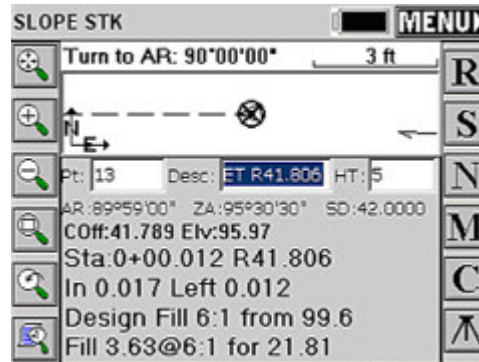
Click on the “**R**” to initiate your first reading. From the Design print out we know our “catch” will be at approximately 40.0 ft right. So, we’ll take our first shot at that offset from centerline. From that shot we get the following info:



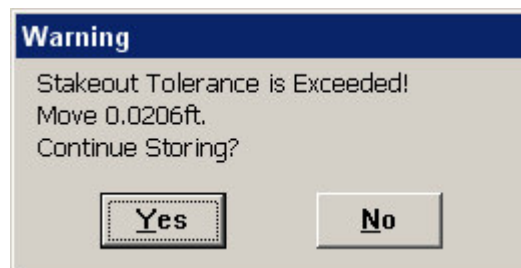
It shows that we're slightly off line and off station, we need to go *Out 2.8* and *Left 2.986*. We'll go out and left about those distances and take another shot by hitting the **R** key.

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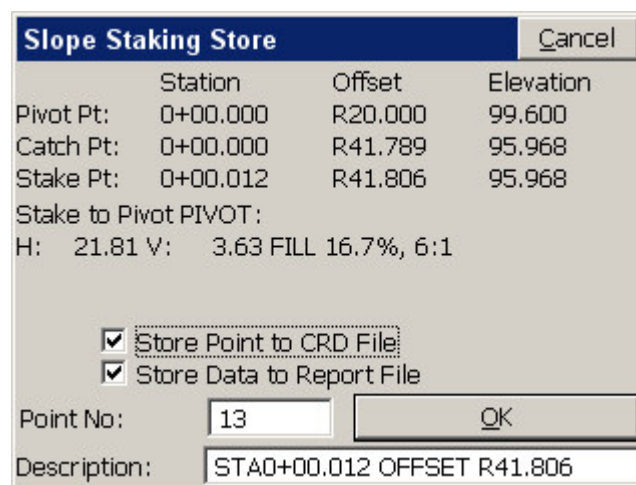
That gives us a CATCH as shown below. We know it's a catch because our *In* distance and *Left* distance is less than a couple of hundredths. More than accurate for slope staking. Also, our *Fill* line shows the correct slope (6:1) we are looking for. On our Stake we would write, "Fill 3.63 / 21.81 / 6:1/ SGS. You will have to determine the best way to write the stakes so that you, the designer and the contractor/grade hop understand them. The key to this is communication between all parties involved.



Since this is a catch, we'll hit "S" to "Store" the results.



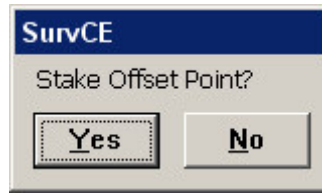
Since this is accurate enough for slope staking I'll disregard the Warning and click Yes to Continue Storing. The *Slope Stake Store* dialog box will open.



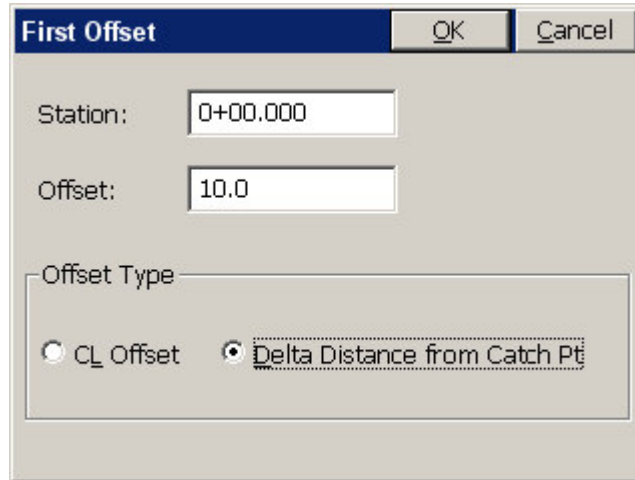
For this we will toggle ON the *Store Point to CRD File* and *Store Data to Report File*. NOTE: How the description defaults to the 'Actual' staked Sta. And Offset. You can edit this *Description*: if you want, but I prefer to leave it as it was staked. Click OK.

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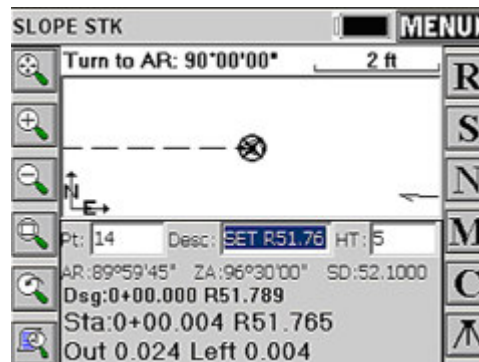
SurvCE will then ask if you'd like to stake an offset point. Click **Yes**.



The *First Offset* box will open, as shown; We will enter an **Offset** of 10.00 ft and toggle the *Offset Type* to **Delta Distance from Catch Pt**. Click **Ok**.

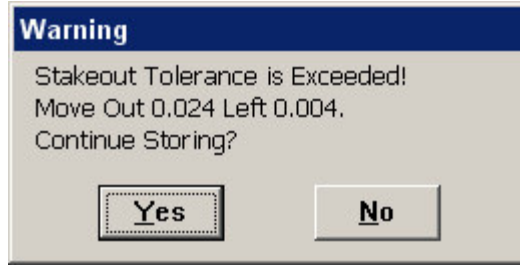


In the field we will measure 10 ft. from out catch point and hit the "**R**" key to take another shot. You will see that our offset is good, so we will "**S**" (Store) this result too.



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Again, we get a *Warning* the “Stakeout Tolerance is Exceeded”. That is fine for slope staking so we’ll click **Yes** to continue storing.



That will open up the *Stakeout Report* as shown.

A "Stakeout Report" dialog box with a blue header bar and a "Cancel" button. It displays coordinate data for "Current" and "Target" points, a "Difference" of 0.02, and two checked options: "Store Point to CRD File" and "Store Data to Report File". There is a "Point No:" field with the value "14" and an "OK" button. The "Description:" field contains the text "STA0+00.004 CATCH OFFSET R51".

	Northing	Easting	Elevation
Current:	10000.00	10051.77	94.10
Target:	10000.00	10051.79	

Difference: 0.02

☒ Store Point to CRD File
☒ Store Data to Report File

Point No: 14 OK

Description: STA0+00.004 CATCH OFFSET R51

Click **OK** and the *Offset Point Report* will open.

An "Offset Point Report" dialog box with a blue header bar and an "OK" button. It shows "OFFSET PT:" information, including Station, Offset, and Elevation. Below this is a table with columns for HDIST, VDIST, and SL. The table contains two rows of data: "OFFSET to CATCH" and "CATCH to PIVOT".

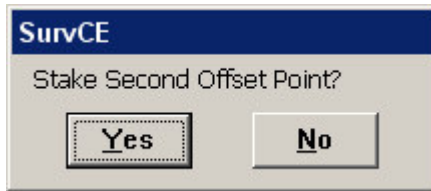
OFFSET PT:

Station:	Offset:	Elevation:
0+00.004	R51.765	94.102

	HDIST	VDIST	SL
OFFSET to CATCH	9.98	1.87	FILL 18
CATCH to PIVOT	21.79	3.63	FILL 16

Click **OK**. SurvCE will quickly flash *Point Stored* and then will ask if you want to stake another offset point.

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Normally you would not stake a second offset point unless maybe your in a real deep cut or have a real high Fill and you want to use the second stake for "line." For now, we'll say **No**.

SurvCE will then take you back to the *Station for Slope Staking* screen and your next station will be up. Enter the changes to your **Pivot Off** and **Pivot Elev**, if any, and continue as we just did.

A screenshot of the "Station for Slope Staking" dialog box. It has a title bar with "OK" and "Cancel" buttons. The main area contains a checked checkbox "Stake Station Interval". Below it are input fields for "Station:" (0+50.000), "Next Interval:" (50.000), "Pivot Off:" (20), and "Pivot Elev:" (99.6). There is a "Read Instrument" button. At the bottom are fields for "Use Point:" (empty), "Cut Slope Ratio:" (2), and "Fill Slope Ratio:" (6). To the right of the "Use Point:" field are two small icons: a list icon and a graph icon.

To print your *Slope Stake Report*

With the Collector in the cradle and hooked up to Active Sync. Open up Windows Explorer on your Office PC and navigate to path where you saved your Slope Stake Report to. When you find the report (in this example my report file was, "Slopestakingtest.txt") make a copy of it and rename it by changing just the ".txt" extension to ".csv." This will make this a "Comma Separated File" that can be opened and edited in an Excel Spreadsheet. You may want to edit the headings so they are more to your liking, otherwise, you can leave them as is.

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The screenshot shows a Microsoft Excel spreadsheet titled "Slopestakingtest.csv". The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	H	I
1	#Design Sta.	Desc	Pivot Off.	Elev: PP/CP	Elev: CP/OS	Dist: CP-PP/OS-CP	Cut	Fill	Slope Ratio
2	0+00.000	CATCH POINT	Right 20.000	99.6	95.968	21.789		3.632	6:01
3	0+00.000	FIRST OFFSET	Right 20.000	95.968	94.102	9.976		1.866	
4									
5									
6									
7									
8									
9									
10									
11									
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13									
14									
15									
16									
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22									
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That's all there is to slope staking by "User Entered" and SurvCE. We will have more "How to's" in the future for the other Definition Methods like Templates/Section Files/and GPS equipment. Stay tuned.